# F I G. 1

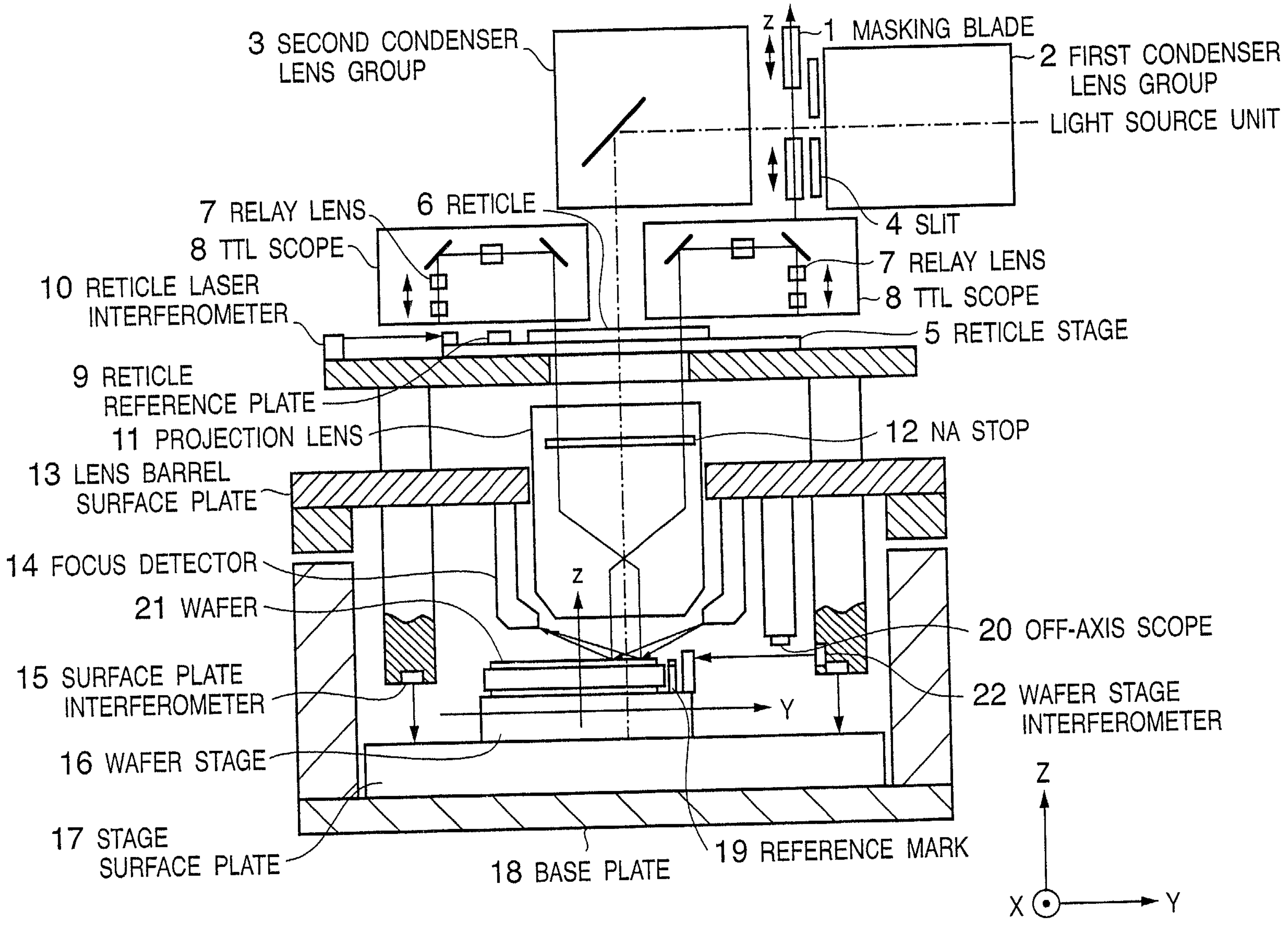

3 SECOND CONDENSER LENS GROUP
z
1 MASKING BLADE
2 FIRST CONDENSER LENS GROUP
LIGHT SOURCE UNIT
4 SLIT
7 RELAY LENS
8 TTL SCOPE
6 RETICLE
7 RELAY LENS
8 TTL SCOPE
10 RETICLE LASER INTERFEROMETER
5 RETICLE STAGE
9 RETICLE REFERENCE PLATE
11 PROJECTION LENS
12 NA STOP
13 LENS BARREL SURFACE PLATE
14 FOCUS DETECTOR
z
21 WAFER
20 OFF-AXIS SCOPE
15 SURFACE PLATE INTERFEROMETER
Y
22 WAFER STAGE INTERFEROMETER
16 WAFER STAGE
17 STAGE SURFACE PLATE
18 BASE PLATE
19 REFERENCE MARK
Z
X
Y

FIG. 2

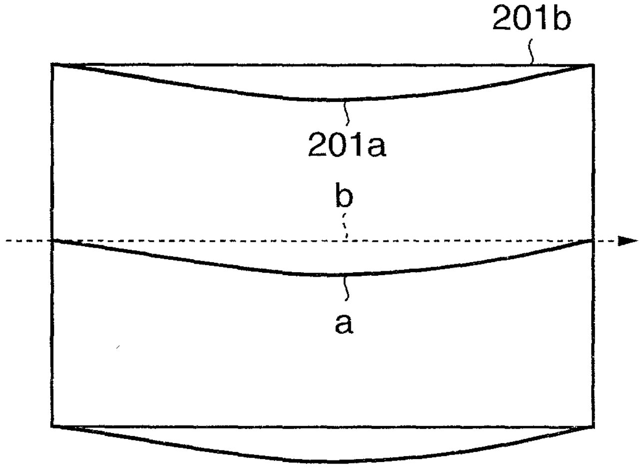
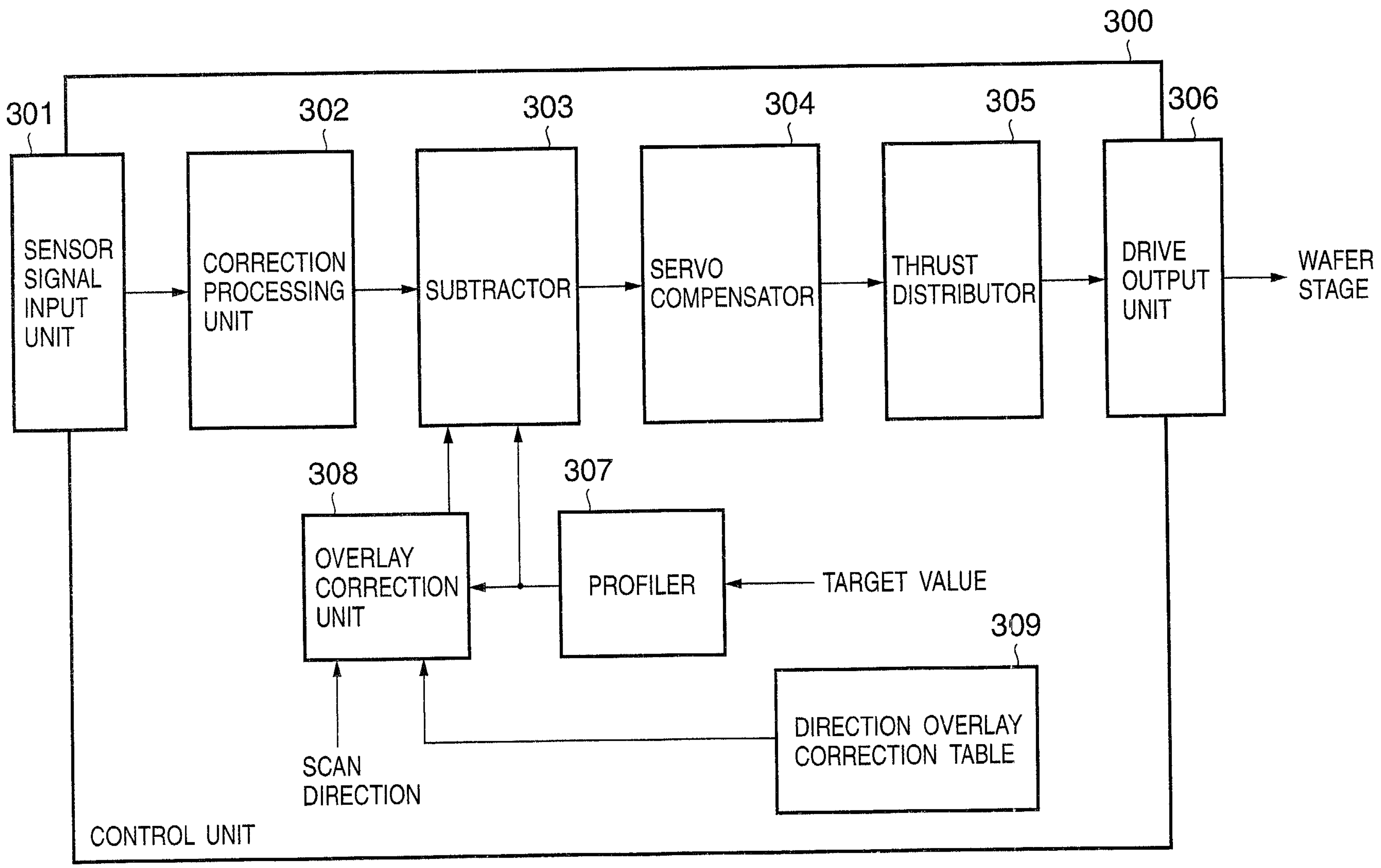
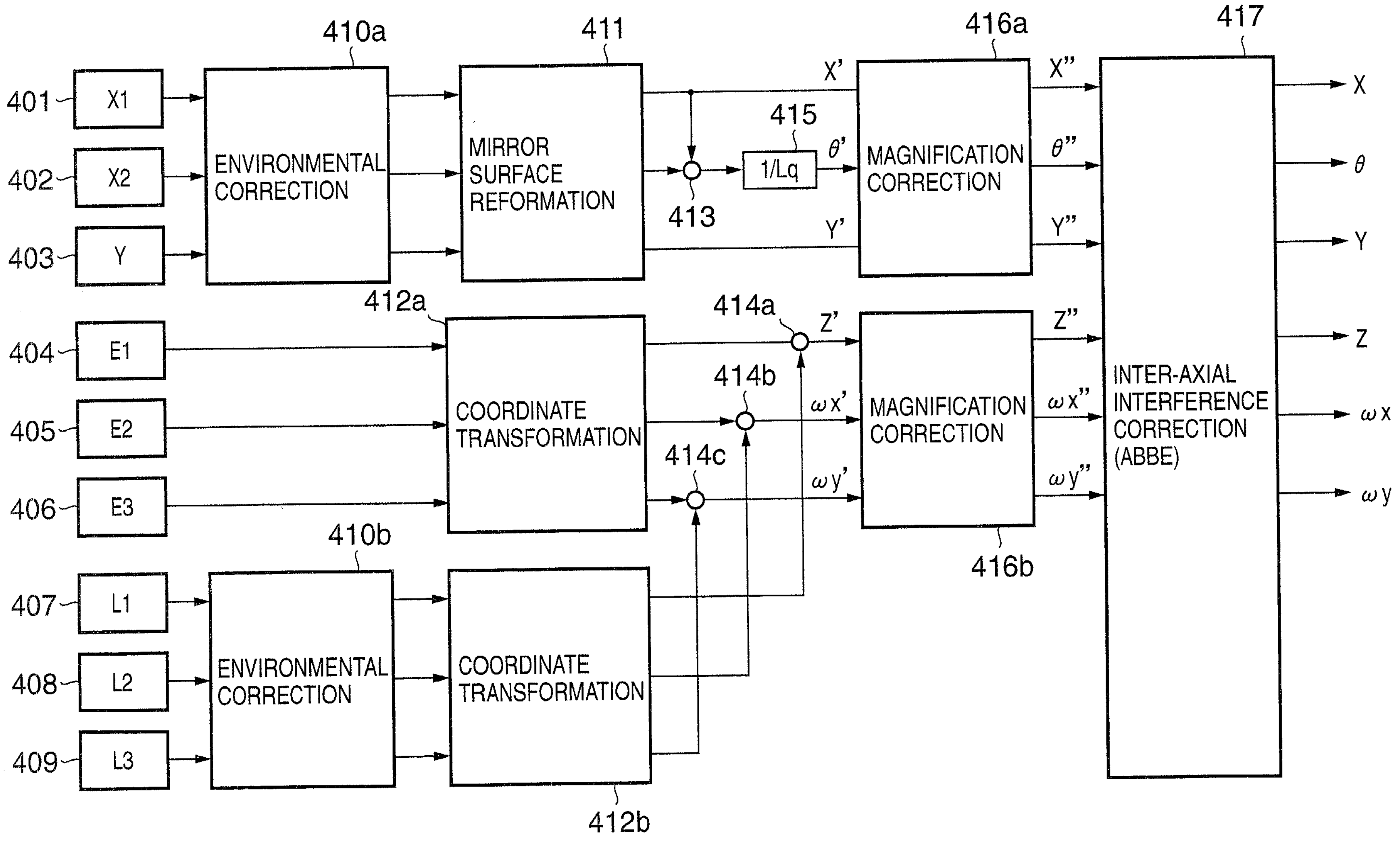


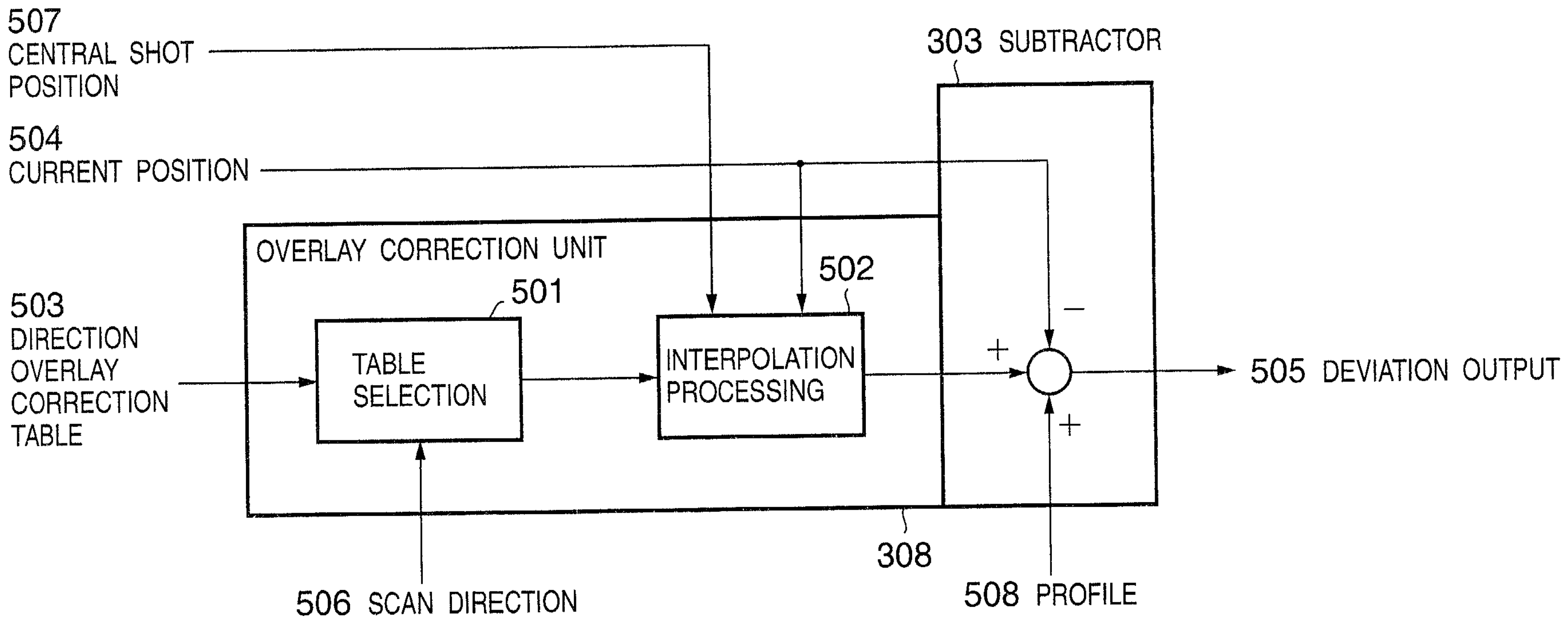
FIG. 3


300
301
SENSOR SIGNAL INPUT UNIT
302
CORRECTION PROCESSING UNIT
303
SUBTRACTOR
304
SERVO COMPENSATOR
305
THRUST DISTRIBUTOR
306
DRIVE OUTPUT UNIT
WAFER STAGE
308
OVERLAY CORRECTION UNIT
307
PROFILER
TARGET VALUE
309
DIRECTION OVERLAY CORRECTION TABLE
SCAN DIRECTION
CONTROL UNIT

# F I G. 4


401
402
403
404
405
406
407
408
409
X1
X2
Y
E1
E2
E3
L1
L2
L3
410a
ENVIRONMENTAL CORRECTION
410b
ENVIRONMENTAL CORRECTION
411
MIRROR SURFACE REFORMATION
412a
COORDINATE TRANSFORMATION
412b
COORDINATE TRANSFORMATION
413
414a
414b
414c
415
1/Lq
X'
θ'
Y'
Z'
ωx'
ωy'
416a
MAGNIFICATION CORRECTION
416b
MAGNIFICATION CORRECTION
X''
θ''
Y''
Z''
ωx''
ωy''
417
INTER-AXIAL INTERFERENCE CORRECTION (ABBE)
X
θ
Y
Z
ωx
ωy

# F I G. 5


507
CENTRAL SHOT POSITION
504
CURRENT POSITION
503
DIRECTION OVERLAY CORRECTION TABLE
OVERLAY CORRECTION UNIT
501
TABLE SELECTION
502
INTERPOLATION PROCESSING
303 SUBTRACTOR
−
+
+
505 DEVIATION OUTPUT
308
506 SCAN DIRECTION
508 PROFILE

# FIG. 6

ORIGIN −16.000 [mm]
INTERVAL 4.000 [mm]

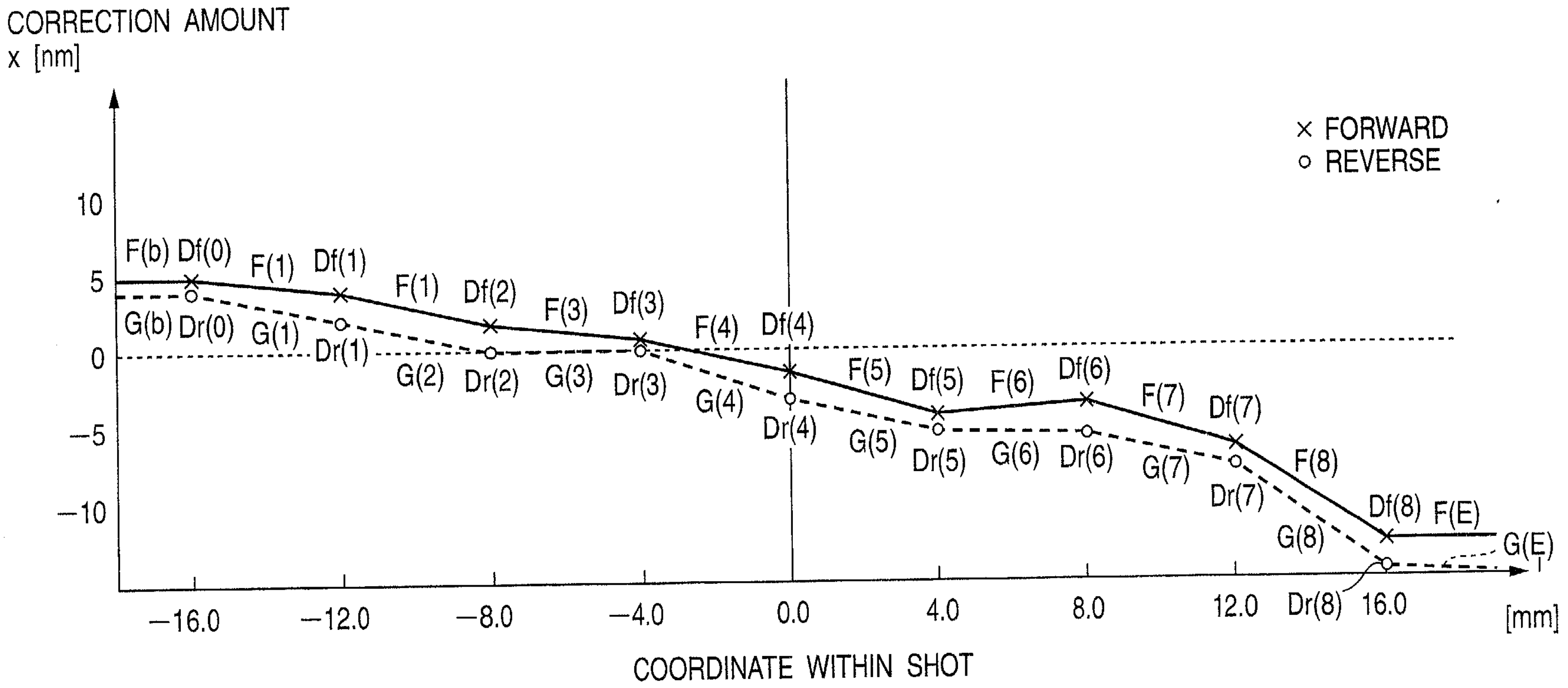
CORRECTION DATA [nm/ppb]
(FORWARD)

| X | Y | Z | Qx | Qy | Qz |
|---|---|---|---|---|---|
| 5 | 1 | 10 | 0 | −10 | 20 |
| 4 | 1 | 8 | 10 | −10 | 10 |
| 2 | 0 | 10 | 20 | 20 | 10 |
| 1 | −1 | 12 | 20 | 40 | 10 |
| −1 | −4 | 13 | 20 | 30 | 0 |
| −4 | −2 | 10 | 40 | 40 | −10 |
| −3 | −4 | 7 | 10 | 50 | −30 |
| −6 | −5 | 4 | 0 | 80 | −30 |
| −12 | −9 | 0 | −20 | 60 | −40 |

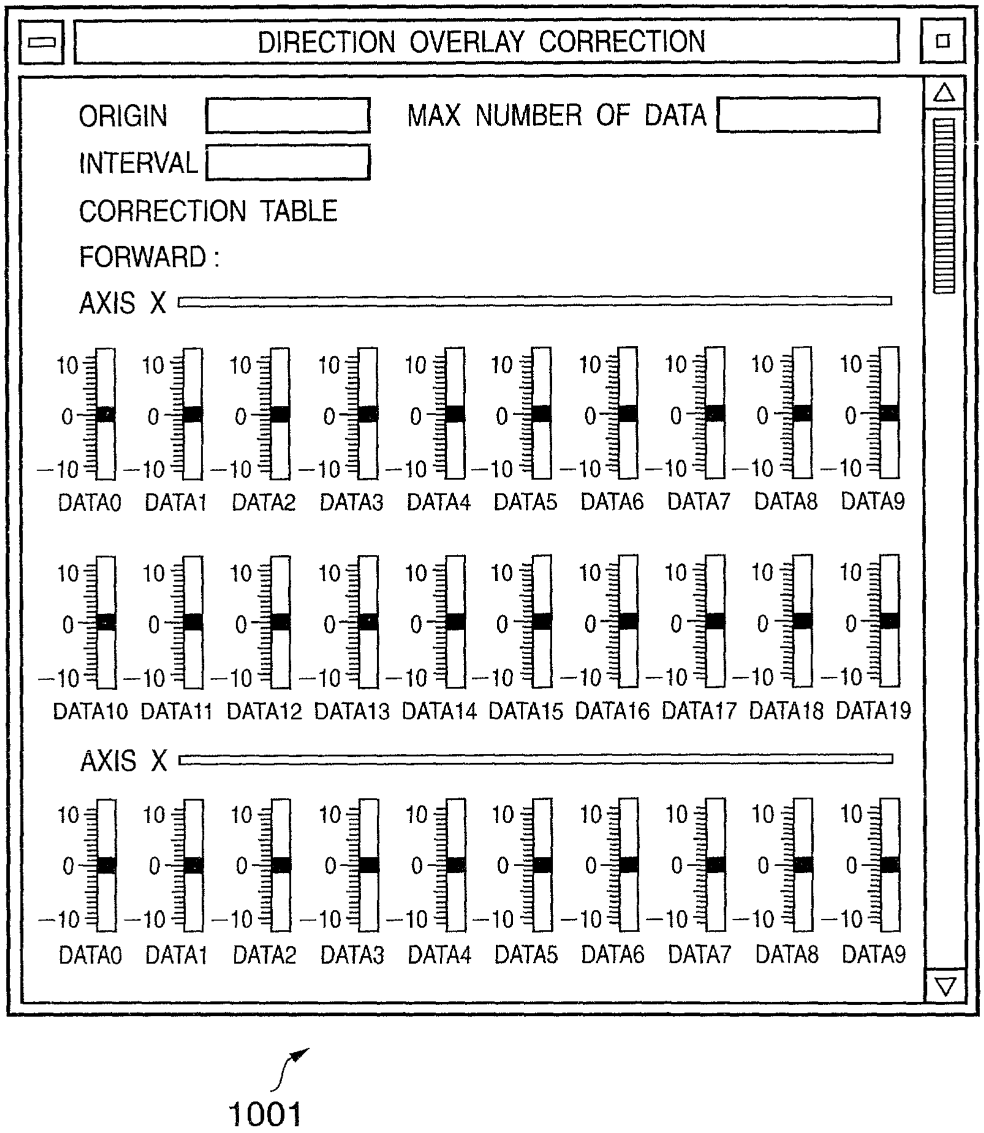
(REVERSE)

| X | Y | Z | Qx | Qy | Qz |
|---|---|---|---|---|---|
| 4 | 0 | 9 | 10 | −10 | 20 |
| 2 | 0 | 6 | 0 | 0 | 10 |
| 0 | −1 | 11 | 10 | 10 | 10 |
| 0 | −1 | 11 | 20 | 30 | 20 |
| −3 | −4 | 10 | 40 | 10 | 0 |
| −5 | −3 | 9 | 20 | 40 | −10 |
| −5 | −4 | 6 | 20 | 60 | −30 |
| −7 | −5 | 4 | 10 | 100 | −30 |
| −14 | −9 | −1 | 0 | 80 | −30 |

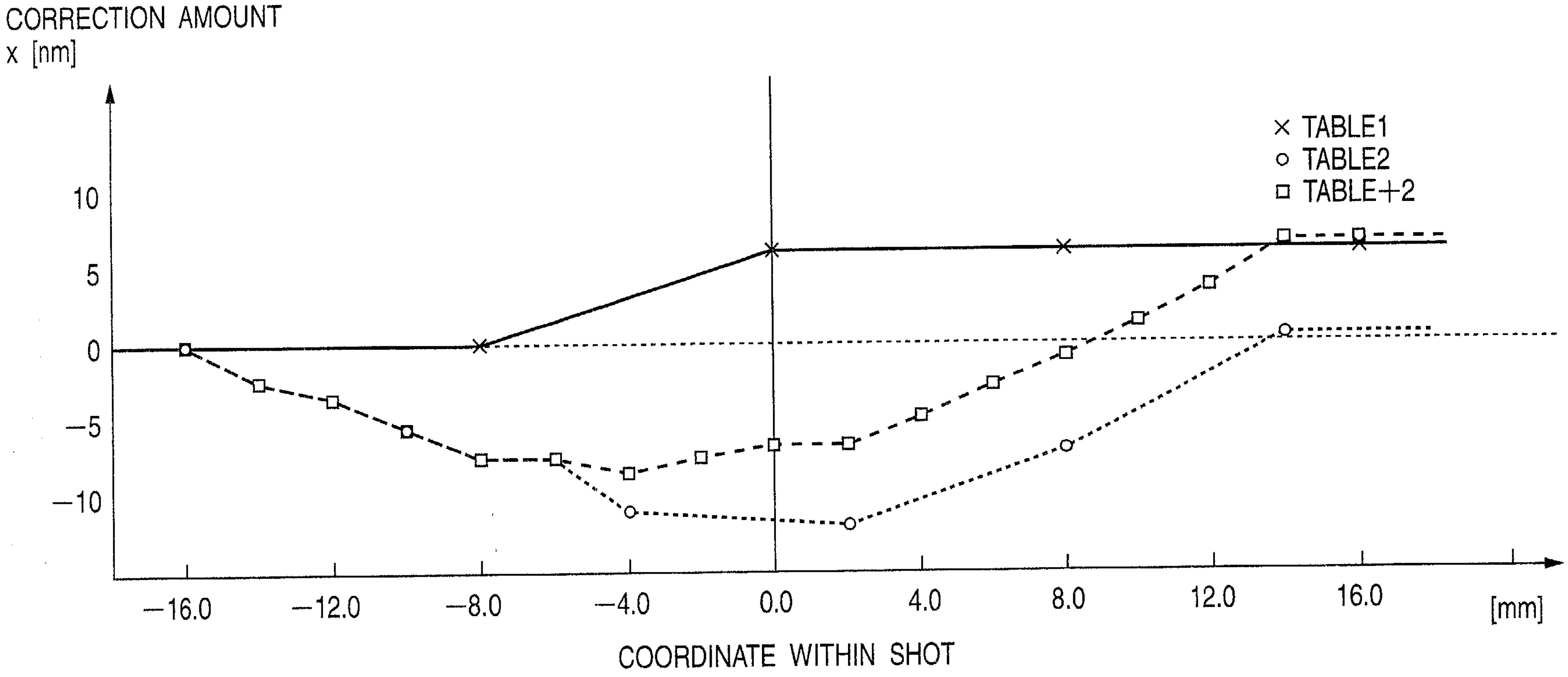
# F I G. 7


CORRECTION AMOUNT
x [nm]
10
5
0
−5
−10
× FORWARD
○ REVERSE
F(b) Df(0)
F(1)
Df(1)
F(1)
Df(2)
F(3)
Df(3)
F(4)
Df(4)
F(5)
Df(5)
F(6)
Df(6)
F(7)
Df(7)
F(8)
Df(8)
F(E)
G(b) Dr(0)
G(1)
Dr(1)
G(2)
Dr(2)
G(3)
Dr(3)
G(4)
Dr(4)
G(5)
Dr(5)
G(6)
Dr(6)
G(7)
Dr(7)
G(8)
Dr(8)
G(E)
−16.0
−12.0
−8.0
−4.0
0.0
4.0
8.0
12.0
16.0
[mm]
COORDINATE WITHIN SHOT

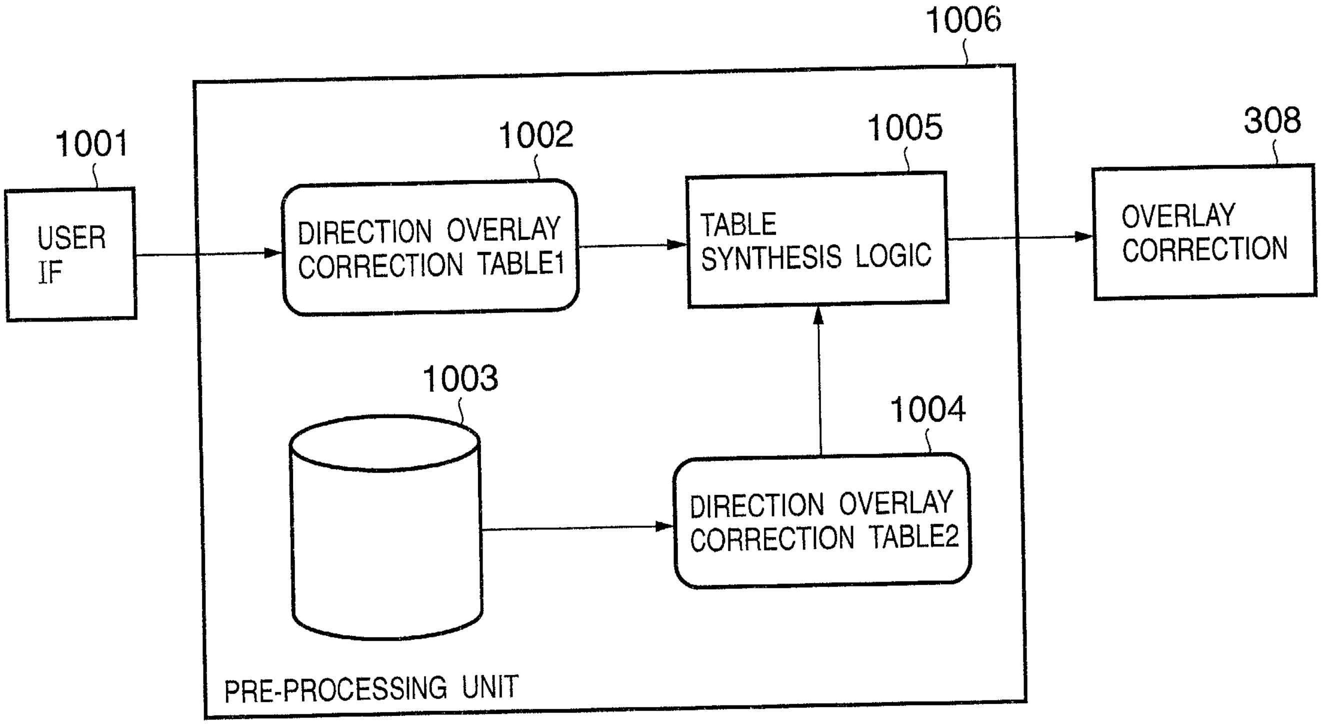
# F I G. 8


DIRECTION OVERLAY CORRECTION
ORIGIN
MAX NUMBER OF DATA
INTERVAL
CORRECTION TABLE
FORWARD :
AXIS X
10
0
−10
DATA0 DATA1 DATA2 DATA3 DATA4 DATA5 DATA6 DATA7 DATA8 DATA9
DATA10 DATA11 DATA12 DATA13 DATA14 DATA15 DATA16 DATA17 DATA18 DATA19
AXIS X
DATA0 DATA1 DATA2 DATA3 DATA4 DATA5 DATA6 DATA7 DATA8 DATA9
1001

# F I G. 9


CORRECTION AMOUNT
x [nm]
10
5
0
−5
−10
× TABLE1
○ TABLE2
□ TABLE+2
−16.0
−12.0
−8.0
−4.0
0.0
4.0
8.0
12.0
16.0
[mm]
COORDINATE WITHIN SHOT

# F I G. 10


1006
1001
USER IF
1002
DIRECTION OVERLAY CORRECTION TABLE1
1005
TABLE SYNTHESIS LOGIC
308
OVERLAY CORRECTION
1003
1004
DIRECTION OVERLAY CORRECTION TABLE2
PRE-PROCESSING UNIT

# FIG. 11

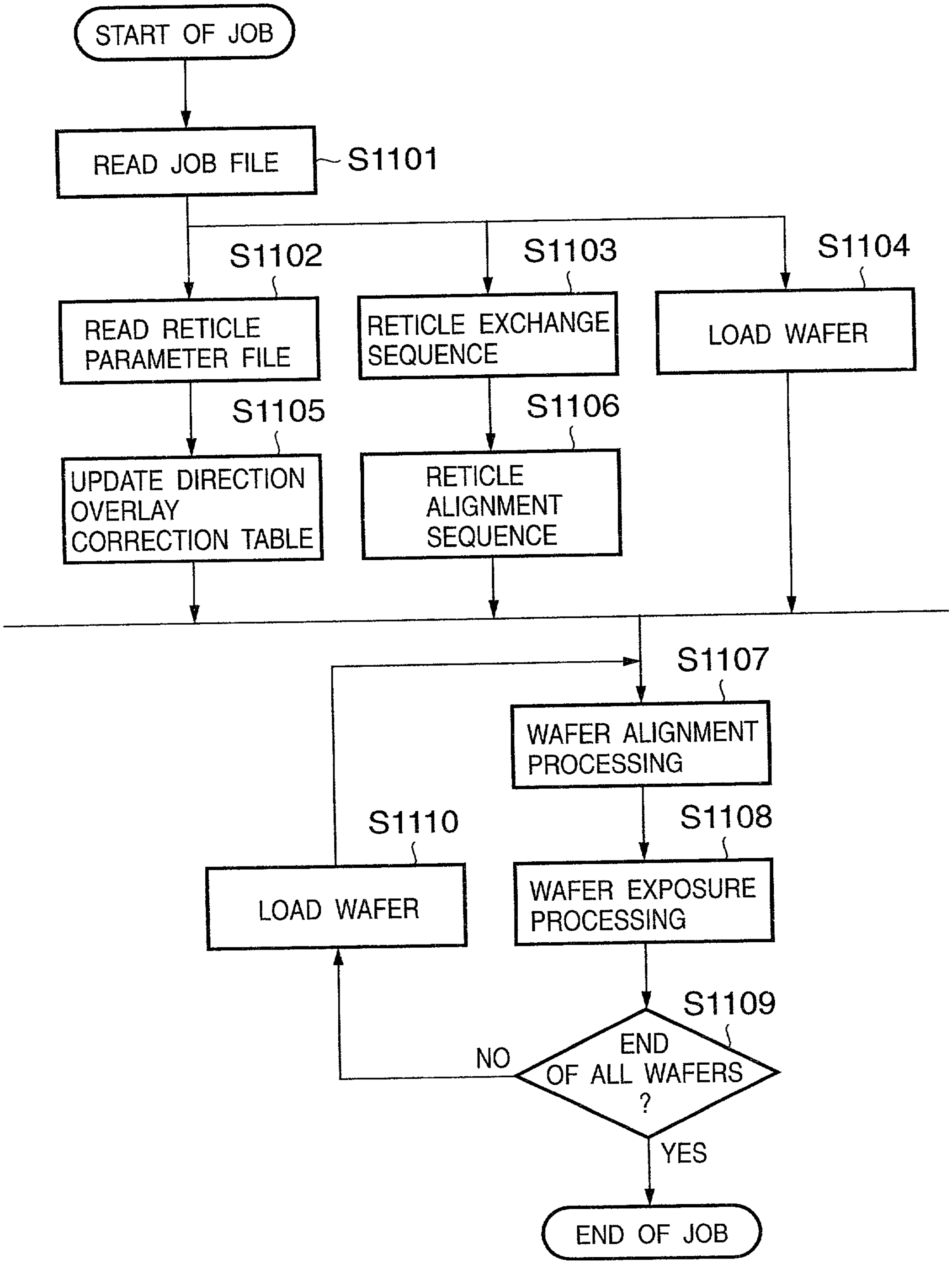
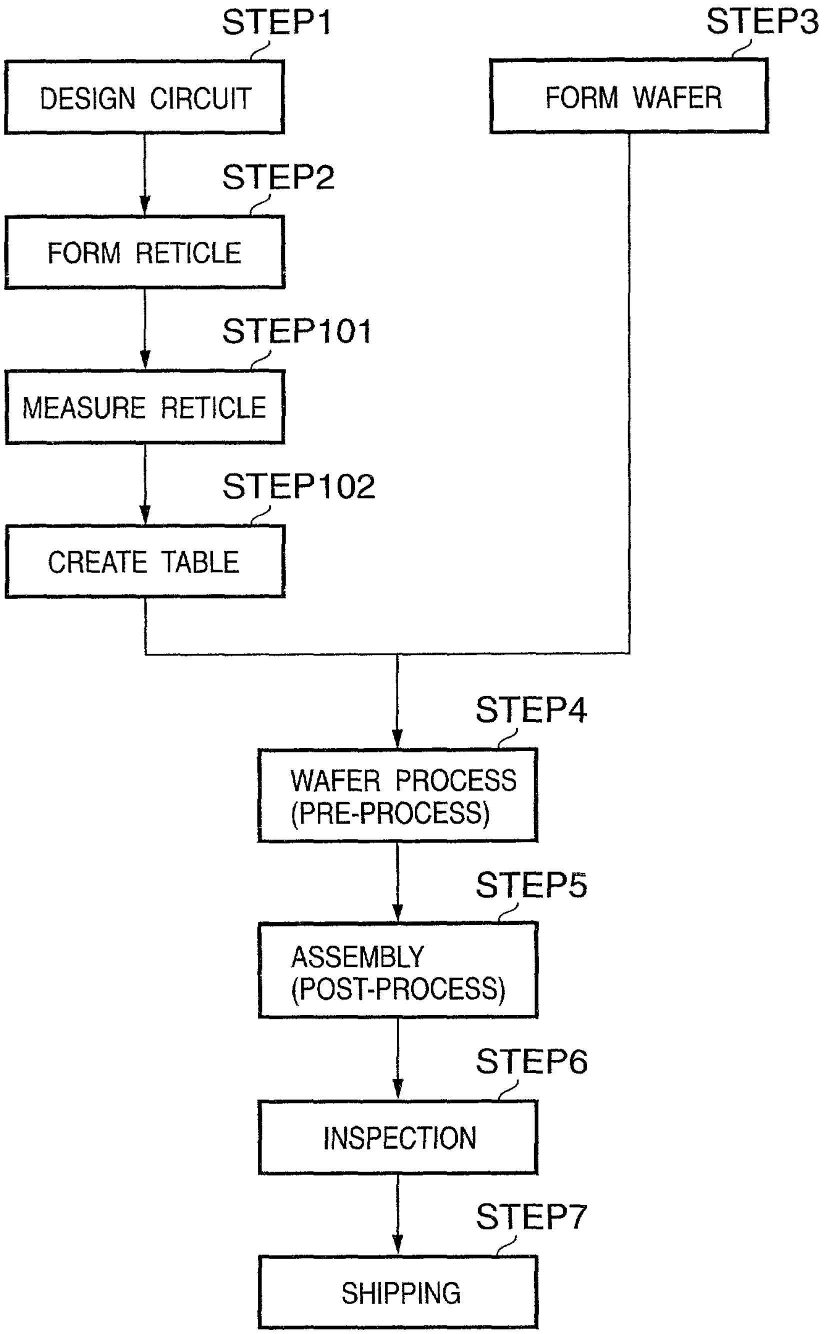
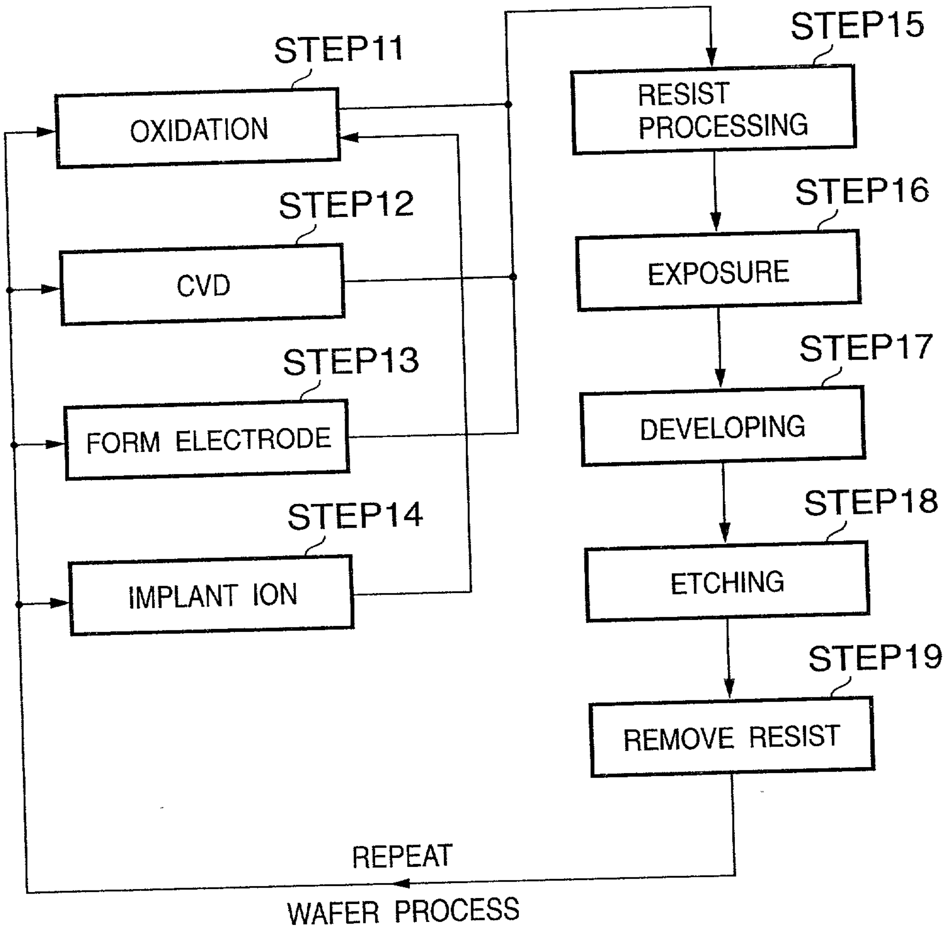

START OF JOB
READ JOB FILE
S1101
S1102
READ RETICLE PARAMETER FILE
S1103
RETICLE EXCHANGE SEQUENCE
S1104
LOAD WAFER
S1105
UPDATE DIRECTION OVERLAY CORRECTION TABLE
S1106
RETICLE ALIGNMENT SEQUENCE
S1107
WAFER ALIGNMENT PROCESSING
S1108
WAFER EXPOSURE PROCESSING
S1110
LOAD WAFER
S1109
END OF ALL WAFERS ?
NO
YES
END OF JOB

FIG. 12



SEMICONDUCTOR DEVICE MANUFACTURING FLOW

FIG. 13


STEP11
OXIDATION
STEP12
CVD
STEP13
FORM ELECTRODE
STEP14
IMPLANT ION
STEP15
RESIST PROCESSING
STEP16
EXPOSURE
STEP17
DEVELOPING
STEP18
ETCHING
STEP19
REMOVE RESIST
REPEAT
WAFER PROCESS